EPA Regional/State/Local Modelers' Workshop

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A&WMA

ATMOSPHERIC MODELING AND METEOROLOGY COMMITTEE:

Comments and Recommendations

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Presentation Overview

- This is a summary of comments from members of the Atmospheric Modeling and Meteorology Technical Committee (AMM) of A&WMA
- Consistent with the focus of this discussion, comments provided here orally are focused on AERMOD modeling and related issues
- Comments related to other topics of interest to AMM members are included in the presentation for reference and documentation, and will be introduced in the other discussion topics as appropriate

Suggested Path Forward: Recommended Areas of Focus and Interest

Suggestions for Near Term Actions:

- From Roger Brode's prior presentation we know that there are many issues planned to be addressed within the AERMOD modeling system and we appreciate your efforts to keep improving it. There are a few other issues we recommend that you consider, and AMM can assist EPA as appropriate.
- We recommend that EPA promptly issue a Clarification memo to allow use of low wind speed options in AERMET and AERMOD, referencing available evaluation and peer-reviewed studies. Appendix W should be updated to include these as default options.
  - Low wind speed review and testing should continue.
  - These conditions can still lead to highest predicted concentrations
- EPA should provide justification for its use of a constant entrainment coefficient of 0.6 in AERMOD for momentum plume rise, explaining why it is better than the variable coefficient used in ISC and different than what is recommended by Briggs (1984), the reference in the AERMOD Model Formulation document.

Suggested Path Forward: Recommended Areas of Focus and Interest

Areas that EPA Consider for Near - Future Appendix W Changes

- Building Downwash – we are aware that EPA has a workgroup to consider this and other modeling areas.
  - We are concerned about substantial changes in how AERMOD models downwash conditions for stack heights at or above the GEP formula height. These concerns were stated at the 10th modeling conference and the 2013 A&WMA Specialty Conference. We encourage EPA to seek feedback from external stakeholders and allow input on a proposed approach before issuing final guidance on basic model formulation changes.
  - Update of the downwash formulation to provide a more realistic treatment of long and narrow buildings is needed.

Suggested Path Forward:
Recommended Areas of Focus and Interest

Areas that EPA Consider for Near-Future Appendix W Changes
(continued)

- Guidance is needed for use of wind-tunnel or computation fluid dynamics applications for dealing with very complex building cases, porous structures and streamlined structures. These issues can be addressed with an Equivalent Building Dimension approach for AERMOD and CALPUFF.
- The PRIME implementation in AERMOD has no meander consideration. In low winds, unexpectedly high downwash concentrations can be predicted, due in part to no meander being modeled.
- In situations with excess heat release around buildings, plume liftoff can occur and downwash is not observed. The PRIME model does not consider this effect.
- All proposed model changes must go through adequate peer review before implementation.

Suggested Path Forward: Recommended Areas of Focus and Interest

Areas that EPA Consider for Near-Future Appendix W Changes:

(continued)

- We recommend that EPA allow ARM2 as an advanced Tier 2 approach for NO_2 modeling (Clarification memo in 2014, followed by incorporation into Appendix W)
- Besides AERMOD, alternative approaches should be considered:
  - Use of sub-hourly meteorological data for computing hourly averages (e.g., “SHARP”) may do a better job for meander effects in some cases.
  - Use of puff models that can simulate non-steady-state effects is another alternative to better account for low wind cases and the limited distance applicability of plume models in these conditions.
  - In some low-wind conditions with limited convective mixing in the morning, various investigators (e.g., Ken Rayner in Australia) have found a tendency for AERMOD to over-predict. Consider working with AERMIC/Dr. Jeff Weil on a review of this issue.

Upcoming Air & Waste Management Association Conference Events

- 2014 Annual Conference Sessions
  - AERMOD Modeling Issues
  - Modeling Studies and Results
  - Short Term Modeling Issues and Guidance
  - Innovative Modeling Techniques
  - Photochemical Modeling Issues
  - Panel Discussion on Guideline on Air Quality Models - A Continuing Dialogue on the Path Forward
  - Panel Discussion on Tools for Characterizing Single - Source Contributions to Ozone and Total $PM_{2.5}$
- 2016 Specialty Conference – following EPA modeling conference

Suggested Path Forward: Additional Comments on Issues of Interest

Following slides provide additional comments from AMM members for EPA consideration and further discussion in appropriate topic areas.

Suggested Path Forward: Additional Comments on Issues of Interest

Areas that EPA Consider for Near-Future Appendix W Changes: *Unique Source Effects*

- Buoyant Line and Point Sources: need workable product to accommodate these types of sources, perhaps using volume sources with release height changing hourly.
- Continue to work with Dr. Chat Cowherd and AISI on refinements to prediction of roadside concentrations.
- Continue to work with AISI on use of urban dispersion for industrial heat island source complexes.
- EPA should provide clarification on the appropriate use of the NO_2/NO_x ratio database. Can data provided for specific sources be used for general source categories, similar to AP-42 emission factor use?

Suggested Path Forward: Additional Comments on Issues of Interest

Areas that EPA Consider for Near-Future Appendix W Changes: *Emissions To Model For Setting Permit Limits*

- Appendix W should be updated to allow use of a longer averaging time (e.g., 30 days) for short-term NAAQS for NSR permitting, this could involve use of statistical techniques such as EMVAP.

- We recommend that EPA allow use of statistical methods to demonstrate that 30-day averaging period emission rates are adequate to assure compliance with short-term NAAQS (e.g., 1-hour SO_2 and NO_2). Appendix W should be updated to allow such statistical methods.

- Since differences between background concentrations and revised NAAQS are shrinking with more stringent standards, a reduction of over-prediction bias for representing effects of other sources is needed. Our recommendations are presented below to mitigate these over-predictions.

  - For background from explicitly modeled sources that will not change from current operations and that are not involved in the permitting, modeling of actual hourly emissions from actual stacks should be used, consistent with SO_2 TAD modeling guidance.

Suggested Path Forward: Additional Comments on Issues of Interest

Areas that EPA to Consider for Near-Future Appendix W Changes:
Emissions To Model For Setting Permit Limits continued

- Note that regional background concentrations already double-count contributions of modeled existing sources, and are biased to over-predict due to use of near-peak statistical forms to represent background for all hours modeled. This bias could be reduced with the use of concurrent hourly monitored concentrations.

- Regional background concentrations estimated for future periods from regional modeling that accounts for planned emission controls should be allowed with appropriate documentation, rather than historical concentrations that represent emissions that are or will be retired.

Suggested Path Forward: Additional Comments on Issues of Interest

- Suggestions for CALPUFF Model Actions for Appendix W
  - CALPUFF v6.42+ is backward compatible with v5.8. CALPUFF v6.42+ should be adopted as a replacement for v5.8 to allow access to 8 years of optional model improvements, including the new chemistry.
  - IWAQM Phase 3 process should be open for public input to enable stakeholder involvement in development of modeling tools for Air Quality Related Values and long-range transport assessments
- Advanced Chemistry Puff Model Development
  - Models such as SCICHEM need careful evaluation, particularly for ozone and PM2.5 concentration predictions
  - This evaluation process could leverage data from existing networks (e.g., SEARCH), Plume Flight data (e.g., SOAS) or new field studies, as well as comparison with #-D Eulerian Models
  - The current combination of AERMOD for short-range modeling and CALPUFF for long-range modeling is awkward and inefficient. EPA should seek to establish a single model for all distances; possibly a puff model
  - Such a model needs careful testing and implementation work

Suggested Path Forward: Additional Comments on Issues of Interest

- Recommendations for Longer Term Activities:
  - An expert scientific advisory panel should be formed to advise EPA in its planning and review of model component changes and guidance on how models are applied.
  - Focus of model evaluations/changes should be on scientific justifications rather than on sensitivity studies; however, EPA should demonstrate that model formulation and guidance changes result in improved performance.
  - EPA should allow for the review of alternate modeling approaches via the Clearinghouse without requiring such requests be tied to a permit application.
  - Collaborative field experiments with EPA input are encouraged.

Suggested Path Forward: How Stakeholders such as AMM Can Help

- Stakeholder groups have expertise in their own areas and may have access to useful databases
- EPA can take advantage of AMM TC and public input in the following areas:
  - Submission of new modeling techniques for EPA to consider
  - White paper on suggested Equivalent Building Dimension methodology
  - Sharing of existing model evaluation databases
  - Stack test results for in-stack ratios of NO_2/NO_x
  - Documentation of unique source effects
  - Collaboration with field testing and new model evaluation